

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

1. (Original) An image processing apparatus using dithering to represent shades, comprising:

a storage portion storing a basic dither pattern configured of a plurality of basic patterns;

a dithering unit using said basic dither pattern to dither image data, said plurality of basic patterns each including a plurality of pixels;

a first assignment portion assigning an initial value to a single pixel in one of said plurality of basic patterns as a number indicating an order to be followed to illuminate a dot in a dither matrix; and

a second assignment portion selecting from said basic patterns longitudinally and laterally arranged a basic pattern remotest from any pixel assigned a number, and assigning a subsequent number to a pixel in said basic pattern selected, wherein said second assignment portion repeats assignment to assign in said basic dither pattern a number indicating an order to be followed to illuminate a dot.

2. (Original) The apparatus of claim 1, wherein in said basic pattern a number indicating an order to be followed to illuminate a dot is assigned to allow the dither matrix to be a dither matrix of dot convergence type.

3. (Original) The apparatus of claim 1, further comprising:

a third assignment portion assigning, when said basic dither pattern has all of its basic patterns each with a single pixel assigned a number, a subsequent number to a pixel adjacent to a pixel assigned a number by said first assignment portion; and

a fourth assignment portion selecting from said basic patterns longitudinally and laterally arranged a basic pattern remotest from any basic pattern including a

pixel assigned a number after said second assignment portion has performed said assignment, and assigning a subsequent number to a pixel adjacent to a pixel in that basic pattern that is assigned a number, wherein said fourth assignment portion repeats assignment to assign in said basic dither pattern a number indicating an order to be followed to illuminate a dot.

4. (Original) The apparatus of claim 1, further comprising a table storage portion storing a table correlating a shade of said image data to a shade in a basic dither pattern, wherein said dithering unit uses said basic dither pattern and said table to dither image data.

5. (Original) The apparatus of claim 4, further comprising an image forming unit forming an image based on image data dithered by said dithering unit.

6. (Original) The apparatus of claim 5, further comprising:
a detector detecting a density of a pattern formed by said image forming unit;
and
a table modification portion driven by the density detected by said detector to modify said table.

7. (Original) An image processing method employing dithering to represent shades, the method using a basic dither pattern configured of a plurality of basic patterns each including a plurality of pixels, the method comprising:

an initial assignment step of assigning an initial value to a single pixel in one of said plurality of basic patterns as a number indicating an order to be followed to illuminate a dot in a dither matrix;

a second assignment step of selecting from said basic patterns longitudinally and laterally arranged a basic pattern remotest from any pixel assigned a number, and assigning a subsequent number to a pixel in said basic pattern selected, repeatedly to assign in said basic dither pattern a number indicating an order to be followed to illuminate a dot; and

a step of storing to a storage portion a basic dither pattern assigned a number indicating an order to be followed to illuminate a dot.

8. (Original) The method of claim 7, wherein in said basic pattern a number indicating an order to be followed to illuminate a dot is assigned to allow the dither matrix to be a dither matrix of dot convergence type.

9. (Original) The method of claim 7, further comprising:

a third assignment step assigning, when said basic dither pattern has all of its basic patterns each with a single pixel assigned a number, a subsequent number to a pixel adjacent to a pixel assigned a number at the first assignment step; and

a fourth assignment portion selecting from said basic patterns longitudinally and laterally arranged a basic pattern remotest from any basic pattern including a pixel assigned a number after the second assignment step has been performed, and assigning a subsequent number to a pixel adjacent to a pixel in that basic pattern that is assigned a number, repeatedly to assign in said basic dither pattern a number indicating an order to be followed to illuminate a dot.

10. (Original) An image processing program product causing a computer to perform an image process representing shades using dithering employing a basic dither pattern configured of a plurality of basic patterns each including a plurality of pixels, the product causing the computer to execute:

an initial assignment step of assigning an initial value to a single pixel in one of said plurality of basic patterns as a number indicating an order to be followed to illuminate a dot in a dither matrix;

a second assignment step of selecting from said basic patterns longitudinally and laterally arranged a basic pattern remotest from any pixel assigned a number, and assigning a subsequent number to a pixel in said basic pattern selected, repeatedly to assign in said basic dither pattern a number indicating an order to be followed to illuminate a dot; and

a step of storing to a storage portion a basic dither pattern assigned a number indicating an order to be followed to illuminate a dot.

11. (Original) The product of claim 10, wherein in said basic pattern a number indicating an order to be followed to illuminate a dot is assigned to allow the dither matrix to be a dither matrix of dot convergence type.

12. (Original) The product of claim 10, causing the computer to further execute:

a third assignment step assigning, when said basic dither pattern has all of its basic patterns each with a single pixel assigned a number, a subsequent number to a pixel adjacent to a pixel assigned a number at the first assignment step; and

a fourth assignment portion selecting from said basic patterns longitudinally and laterally arranged a basic pattern remotest from any basic pattern including a pixel assigned a number after the second assignment step has been performed, and assigning a subsequent number to a pixel adjacent to a pixel in that basic pattern that is assigned a number, repeatedly to assign in said basic dither pattern a number indicating an order to be followed to illuminate a dot.

13. (Original) An image processing apparatus using dithering to represent shades, comprising

a storage portion storing a basic dither pattern configured of a plurality of basic patterns; and

a dithering unit using said basic dither pattern to dither image data, wherein said plurality of basic patterns each including a plurality of pixels, said basic dither pattern has each pixel assigned a number indicating an order to be followed to illuminate a dot in a dither matrix,

a single pixel in one of said plurality of basic patterns is assigned an initial value of said number, and

subsequently when said basic patterns are arranged longitudinally and laterally a basic pattern remotest from any pixel assigned a number is selected in order and a pixel in that selected basic pattern is assigned a subsequent number.

14. (Original) The apparatus of claim 13, wherein in said basic pattern a number indicating an order to be followed to illuminate a dot is assigned to allow the dither matrix to be a dither matrix of dot convergence type.

15. (Original) The apparatus of claim 13, further comprising a table storage portion storing a table correlating a shade of said image data to a shade in a basic dither pattern, wherein said dithering unit uses said basic dither pattern and said table to dither image data.

16. (Original) The apparatus of claim 15, further comprising an image forming unit forming an image based on image data dithered by said dithering unit.

17. (Original) The apparatus of claim 16, further comprising;
a detector detecting a density of a pattern formed by said image forming unit;
and
a table modification portion driven by the density detected by said detector to modify said table.

18. (New) An image processing method employing dithering, comprising the steps of :

employing a basic dither pattern capable of representing a first number of shades;

associating a shade of a second number of shades with a shade of the first number of shades, wherein the second number of shades is smaller than the first number of shades;

storing the associated shades in a table;

detecting in said table an amount of variation in a density value of each shade of the first number of shades relative to the amount of variation of each associated shade of the second number of shades; and

modifying the correspondence of the associated shade of the second number of shades and the shade of the first number of shades in the table based on the results of the detecting step.

19. (New) An image processing program stored on a computer-readable medium for causing a computer to perform an image process employing dithering, the program causing the computer to perform the steps of:

employing a basic dither pattern capable of representing a first number of shades;

associating a shade of a second number of shades with a shade of the first number of shades, wherein the second number of shades is smaller than the first number of shades;

storing the associated shades in a table;

detecting in said table an amount of variation in a density value of each shade of the first number of shades relative to the amount of variation of each associated shade of the second number of shades; and

modifying the correspondence of the associated shade of the second number of shades and the shade of the first number of shades in the table based on the results of the detecting step.

20. (New) An image processing apparatus using dithering to represent shades, comprising:

a dither pattern storage portion for storing a basic dither pattern capable of representing a first number of shades;

a table storage portion for storing a table in which a shade of a second number of shades is associated with a shade of the first number of shades, wherein the second number of shades is smaller than the first number of shades;

a detection portion for detecting in said table an amount of the variation in a density value of each shade of the first number of shades relative to the amount of variation of each associated shade of the second number of shades; and

a table modification portion for modifying the correspondence of the associated shade of the second number of shades and the shade of the first number of shades in the table based on the results of the detection by the detection portion.

21. (New) An image processing method employing dithering, comprising the steps of:

employing a basic dither pattern capable of representing a first number of shades;

associating a shade of a second number of shades with a shade of said first number of shades, wherein the second number of shades is smaller than the first number of shades;

storing the associated shades in a table;

referring to said table to obtain a shade of said first number of shades that corresponds to a predetermined shade of said second number of shades, applying the obtained shade to print a density detection pattern;

measuring the density values of printed density detection pattern with a sensor;

modifying the value of the output of said sensor in accordance with said predetermined shade; and

employing the modified value of the output of said sensor to modify a correspondence in said table.

22. (New) An image processing program stored on a computer-readable medium for causing a computer to perform an image process employing dithering, the program causing the computer to perform the steps of:

employing a basic dither pattern capable of representing a first number of shades;

associating a shade of a second number of shades with a shade of said first number of shades, wherein the second number of shades is smaller than the first number of shades;

storing the associated shades in a table;

referring to said table to obtain a shade of said first number of shades that corresponds to a predetermined shade of said second number of shades, applying the obtained shade to print a density detection pattern;

measuring the density values of printed density detection pattern with a sensor;

modifying the value of the output of said sensor in accordance with said predetermined shade; and

employing the modified value of the output of said sensor to modify a correspondence in said table.

23. (New) An image processing apparatus using dithering to represent shades, comprising a computer processor for performing the steps of:

a dither pattern storage portion for storing a basic dither pattern capable of representing a first number of shades;

a table storage portion for storing a table in which a shade of a second number of shades is associated having a density values lower than said first number of shades, wherein the second number of shades is smaller than the first number of shades;

a density measurement portion for referring to said table to obtain a shade of said first number of shades that corresponds to a predetermined shade of said second number of shades, applying the obtained shade to print a density detection pattern, and measuring the density values of a printed density detection pattern with a sensor; and

a table modification portion for modifying the value of the output of said sensor in accordance with said predetermined shade, and employing the modified value of the output of said sensor to modify a correspondence in said table.